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Computer Orgnisation

Basic Units of computer

Functional unit: - A computer consists of five functionally independent main parts input, memory, arithmetic logic unit (ALU), output and control unit.
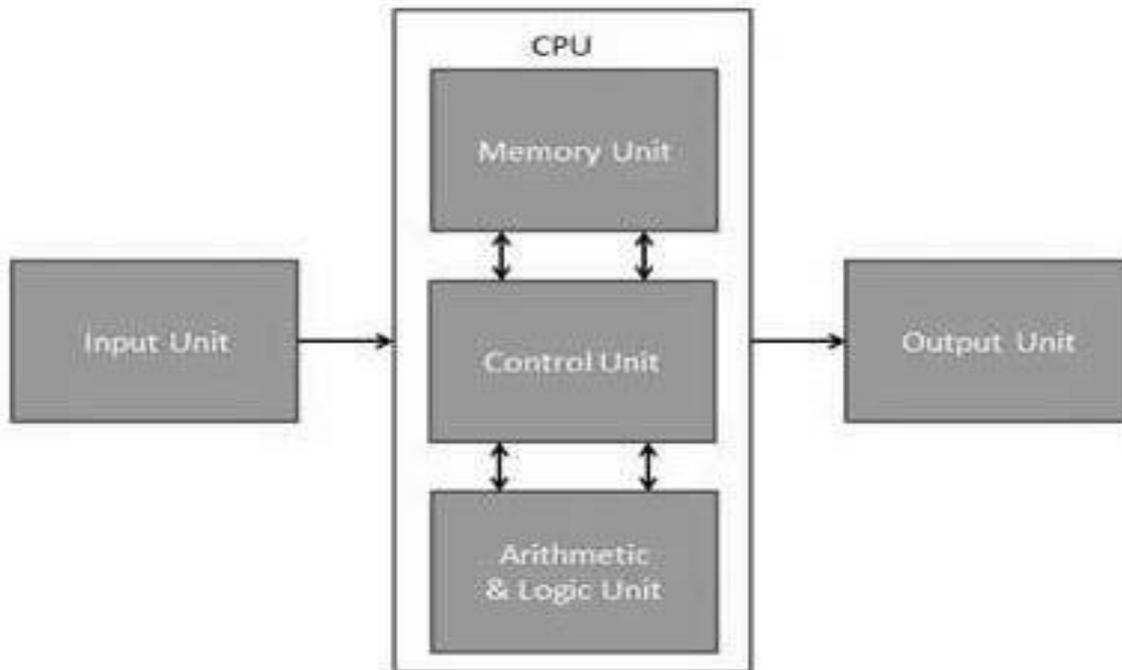

Fig.-Functional unit of Computer

Input Unit

This unit contains devices with the help of which we enter data into the computer. This unit creates a link between the user and the computer. The input devices translate the information into a form understandable by the computer.

The source program/high level language program/coded information/simply data is fed to a computer through input devices keyboard is a most common type.

Whenever a key is pressed, one corresponding word or number is translated into its equivalent binary code over a cable & fed either to memory or processor.

Examples:

Keyboard, Mouse, Joy Stick, Light pen, Track Ball, Scanner,Graphic Tablet, Microphone, Magnetic Ink Card Reader (MICR), Optical Character Reader (OCR), Bar Code Reader, Optical Mark Reader (OMR) etc.

Memory or Storage Unit

This unit can store instructions, data, and intermediate results. This unit supplies information to other units of the computer when needed. It is also known as internal storage unit or the main memory or the primary storage or Random Access Memory (RAM).

Its function into store programs and data.It is basically to two types
1. Primary memory
2. Secondary memory

1. Primary memory: - Is the one exclusively associated with the processor and operates at the electronics speeds programs must be stored in this memory while they are being executed. The memory contains a large number of semiconductors storage cells. Each capable of storing one bit of information. These are processed in a group of fixed site called word.

To provide easy access to a word in memory, a distinct address is associated with each word location. Addresses are numbers that identify memory location.

Number of bits in each word is called word length of the computer. Programs must reside in the memory during execution. Instructions and data can be written into the memory or read out under the control of processor.

Memory in which any location can be reached in a short and fixed amount of time after specifying its address is called random-access memory (RAM).

The time required to access one word in called memory access time. Memory which is only readable by the user and contents of which can't be altered is called read only memory (ROM) it contains operating system.

Caches are the small fast RAM units, which are coupled with the processor and are aften contained on the same IC chip to achieve high performance. Although primary storage is essential it tends to be expensive.

2 Secondary memory: - Is used where large amounts of data & programs have to be stored, particularly information that is accessed infrequently.

Examples: - Magnetic disks & tapes, optical disks (ie CD-ROM's), floppies etc.

Functions of the memory unit are:

- It stores all the data and the instructions required for processing.
- It stores intermediate results of processing.
- It stores the final results of processing before these results are released to an output device.
- All inputs and outputs are transmitted through the main memory.

Control Unit

This unit controls the operations of all parts of the computer but does not carry out anyactual data processing operations.

It effectively is the nerve center that sends signals to other units and senses their states. The actual timing signals that govern the transfer of data between input unit, processor, memory and output unit are generated by the control unit.

Functions of this unit are:
- It is responsible for controlling the transfer of data and instructions among other units of a computer.
- It manages and coordinates all the units of the computer.
- It obtains the instructions from the memory, interprets them, and directs the operation of the computer.
- It communicates with Input/Output devices for transfer of data or results from storage.
- It does not process or store data.

ALU (Arithmetic Logic Unit)

This unit consists of two subsections namely,
1. Arithmetic Section
2. Logic Section

1.Arithmetic Section

Function of arithmetic section is to perform arithmetic operations like addition, subtraction, multiplication, and division. All complex operations are done by making repetitive use of the above operations.

2.Logic Section

Function of logic section is to perform logic operations such as comparing, selecting, matching, and merging of data.

<u>Output Unit</u>

The output unit consists of devices with the help of which we get the information from the computer. This unit is a link between the computer and the users. Output devices translate the computer's output into a form understandable by the users.

These actually are the counterparts of input unit. Its basic function is to send the processed results to the outside world.

Examples:- Printer, speakers, monitor etc.

some of the important input devices which are used in a computer:

- Keyboard
- Mouse
- Joy Stick
- Light pen
- Track Ball
- Scanner
- Graphic Tablet
- Microphone
- Magnetic Ink Card Reader (MICR)
- Optical Character Reader (OCR)
- Bar Code Reader
- Optical Mark Reader (OMR)

Keyboard

Keyboard is the most common and very popular input device which helps to input data to the computer. The layout of the keyboard is like that of traditional typewriter, although there are some additional keys provided for performing additional functions.

Keyboards are of two sizes 84 keys or 101/102 keys, but now keyboards with 104 keys or 108 keys are also available for Windows and Internet.

Mouse

Mouse is the most popular pointing device. It is a very famous cursor-control device having a small palm size box with a round ball at its base, which senses the movement of the mouse and sends corresponding signals to the CPU when the mouse buttons are pressed.

Generally, it has two buttons called the left and the right button and a wheel is present between the buttons. A mouse can be used to control the position of the cursor on the screen, but it cannot be used to enter text into the computer.

Advantages
- Easy to use
- Not very expensive
- Moves the cursor faster than the arrow keys of the keyboard

Joystick

Joystick is also a pointing device, which is used to move the cursor position on a monitor screen. It is a stick having a spherical ball at its both lower and upper ends. The lower spherical ball moves in a socket. The joystick can be moved in all four directions.

The function of the joystick is similar to that of a mouse. It is mainly used in Computer Aided Designing (CAD) and playing computer games.

Light Pen

Light pen is a pointing device similar to a pen. It is used to select a displayed menu item or draw pictures on the monitor screen. It consists of a photocell and an optical system placed in a small tube.

When the tip of a light pen is moved over the monitor screen and the pen button is pressed,its photocell sensing element detects the screen location and sends the corresponding signal to the CPU.

Track Ball

Track ball is an input device that is mostly used in notebook or laptop computer, insteadof a mouse. This is a ball which is half inserted and by moving fingers on the ball, thepointer can be moved.

Since the whole device is not moved, a track ball requires less space than a mouse. A track ball comes in various shapes like a ball, a button, or a square.

Scanner

Scanner is an input device, which works more like a photocopy machine. It is used when some information is available on paper and it is to be transferred to the hard disk of the computer for further manipulation.

Scanner captures images from the source which are then converted into a digital form that can be stored on the disk. These images can be edited before they are printed.

Digitizer

Digitizer is an input device which converts analog information into digital form. Digitizer can convert a signal from the television or camera into a series of umbers that could be stored in a computer. They can be used by the computer to create a picture of whateverthe camera had been pointed at.

Digitizer is also known as Tablet or Graphics Tablet as it converts graphics and pictorial data into binary inputs. A graphic tablet as digitizer is used for fine works of drawing and image manipulation applications.

Microphone

Microphone is an input device to input sound that is then stored in a digital form. The microphone is used for various applications such as adding sound to a multimedia presentation or for mixing music.

Magnetic Ink Card Reader (MICR)

MICR input device is generally used in banks as there are large number of cheques to be processed every day. The bank's code number and cheque number are printed on the cheques with a special type of ink that contains particles of magnetic material that are machine readable.

This reading process is called Magnetic Ink Character Recognition (MICR). The main advantages of MICR is that it is fast and less error prone.

Optical Character Reader (OCR)

OCR is an input device used to read a printed text.
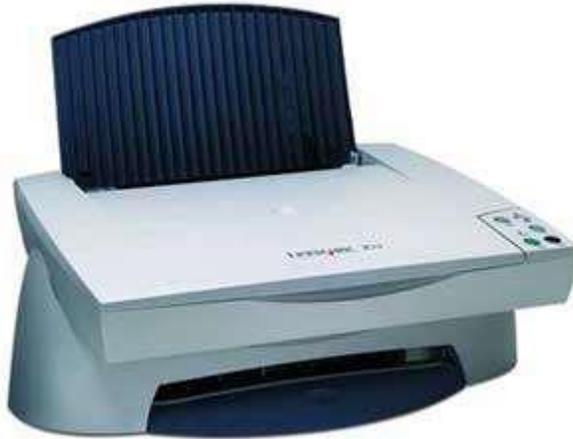
OCR scans the text optically, character by character, converts them into a machine readable code, and stores the text on the system memory.

Bar Code Readers

Bar Code Reader is a device used for reading bar coded data (data in the form of light and dark lines). Bar coded data is generally used in labeling goods, numbering the books, etc.It may be a handheld scanner or may be embedded in a stationary scanner.

Bar Code Reader scans a bar code image, converts it into an alphanumeric value, which isthen fed to the computer that the bar code reader is connected to.

Optical Mark Reader (OMR)

OMR is a special type of optical scanner used to recognize the type of mark made by pen or pencil. It is used where one out of a few alternatives is to be selected and marked.

It is specially used for checking the answer sheets of examinations having multiple choice questions.

some of the important output devices used in a computer.

- Monitors
- Graphic Plotter
- Printer

Monitors

Monitors, commonly called as **Visual Display Unit** (VDU), are the main output device of a computer. It forms images from tiny dots, called pixels that are arranged in a rectangular form. The sharpness of the image depends upon the number of pixels.

There are two kinds of viewing screen used for monitors.

- Cathode-Ray Tube (CRT)
- Flat-Panel Display

Cathode-Ray Tube (CRT) Monitor

The CRT display is made up of small picture elements called pixels. The smaller the pixels,the better the image clarity or resolution. It takes more than one illuminated pixel to forma whole character, such as the letter 'e' in the word help.

A finite number of characters can be displayed on a screen at once. The screen can bedivided into a series of character boxes - fixed location on the screen where a standardcharacter can be placed. Most screens are capable of displaying 80 characters of datahorizontally and 25 lines vertically.

There are some disadvantages of CRT:
- Large in Size
- High power consumption

Flat-Panel Display Monitor

The flat-panel display refers to a class of video devices that have reduced volume, weightand power requirement in comparison to the CRT. You can hang them on walls or wear them on your wrists. Current uses of flat-panel displays include calculators, video games, monitors, laptop computer, and graphics display. The flat-panel display is divided into two categories:

- **Emissive Displays** - Emissive displays are devices that convert electrical energyinto light. For example, plasma panel and LED (Light-Emitting Diodes).
- **Non-Emissive Displays** - Non-emissive displays use optical effects to convertsunlight or light from some other source into graphics patterns. For example, LCD(Liquid-Crystal Device).

Graphic Plotter

A **plotter** produces vector graphics drawings. Plotters draw lines on paper using a pen. In the past, plotters were used in applications such as computer-aided design, as they were able to produce line drawings much faster and of a higher quality than contemporary conventional printers, and small desktop plotters were often used for business graphics. Although they retained a niche for producing very large drawings for many years, plotters have now largely been replaced by wide-format conventional printers
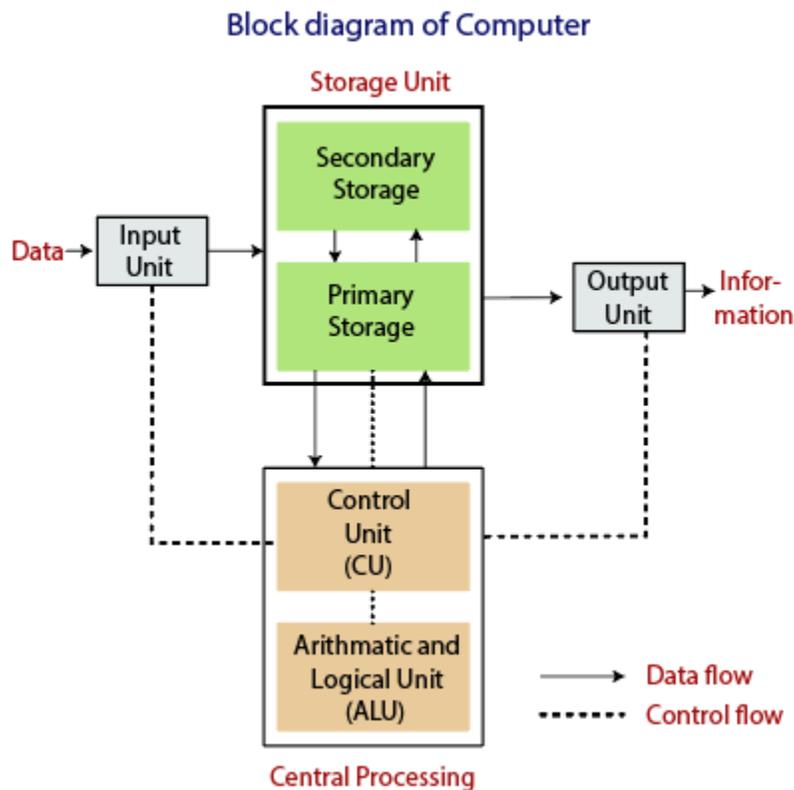
Printers

Printer is an output device, which is used to print information on paper.
There are two types of printers:
- Impact Printers
- Non-Impact Printers

Block diagram of computer

Block diagram of Computer

Storage Unit

Secondary Storage

Data → Input Unit

Primary Storage

Output Unit → Infor-mation

Control Unit (CU)

Arithmatic and Logical Unit (ALU)

→ Data flow
······· Control flow

Central Processing

Input Unit

This unit contains devices with the help of which we enter data into computer. This unit is linked between user and computer. Input devices translate the human being information into the form understandable by computer.

The input, output and storage devices are described as on-line, when they are directly connected to the CPU, when not connected directly they are described as off-line.

Output Unit

Output unit consists of devices with the help of which we get the information from computer. Output unit is a link between computer and users. Output devices translate the computers output into the form under-standable by users.

Central Processing Unit

CPU is considered as the brain of the computer. CPU perform all types of data processing operations. It stores data, intermediate results and instructions (program). It controls the operation of all parts of computer.

CPU itself has following three components.

(A) ALU – This unit consists of two subsection namely: (i) Arithmetic section. (ii) Logic section

- Function of Arithmetic section is to perform arithmetic operations like addition, subtraction, multiplication & division. All complex operations are done by making repetitive use of above operations.
- Function of logic section is to perform logic operations such as comparing, selecting, matching and merging of data.

The arithmetic & logic unit contains a number of storage locations referred to as registers. These registers are composed of electronic circuitry having the capability of adding, subtracting, multiplying, rounding off etc. The number of registers in a computer vary from model to model. However, the basic registers in any computer are the adder and the accumulator.

(B) Control Unit – Control unit controls the operations of all parts of computer. It does not carry out any actual data processing operations. Functions of this unit are:

- It retrieves instructions from the main memory and determines what is to be taken.
- It then retrieves the data required to be processed from the main memory.
- It causes the CPU to actually carry out required operations and determines whether the required operations have been carried out or not.
- It places the processed results in the output area of the memory
- It fetches the next instruction from the memory and repeat the whole cycle of operations outlined above.

(C) Memory or Storage Unit – This unit can store instruction, data and intermediate results. This unit supplies information to the other units of the computer when needed. It is also known as internal storage unit or main memory or primary storage or Random access memory (RAM). Its size affects speed, power and capability. The main memory can be divided into four areas that have no fixed or built-in-physical boundaries within the memory. These areas are:

- Input storage area
- Working storage area
- Output storage area
- Program storage area.

There are two types of memories in the computer. The first type is called as primary memory and the other type is called as secondary memory. The primary memory offers temporary storage and the secondary memory provides permanent storage.